effect of ether;[3] a conclusion made even more certain by the fact that other species were bred during the same time, under identical conditions, and with the same treatment, but without the production of mutations. There is every reason to believe, therefore, that the cause of the mutation in each case was purely fortuitous.

One of the aims of our work on the Drosophilas is to apply the chromosome hypothesis to species having chromosomes different from those of *D. ampelophila*. The experimental work of Morgan and others on *D. ampelophila* has pointed directly to the conclusion that the four groups of linked factors which they have studied are located, respectively, in the four pairs of chromosomes of this species. One of us has recently shown in the paper above cited that several other species of *Drosophila* have chromosome groups differing from that of *ampelophila* in the number and relative sizes of the chromosomes. Of the two species considered in the present paper, one, "species B," has six pairs of chromosomes, and should therefore, on the chromosome hypothesis, give six series of linked characters. The other, *D. tripunctata,* has four pairs of chromosomes, but of a type essentially different from that of *ampelophila,* and consequently should also give essentially different linkage series.

It is significant that both of the mutations which we have found (axillary and confluent), are represented by similar mutations in *D. ampelophila*. Judging from these it is not too much to expect that among other mutations which may subsequently arise in our species, some will likewise correspond to some of those in *ampelophila,* and that upon this basis it may be possible to homologize linkage groups, and thus more definitely homologize chromosomes in different species.

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A SEX-LINKED CHARACTER IN DROSOPHILA REPLETA

Drosophila repleta Wollaston (*D. punctulata* Loew) is a cosmopolitan species, though only recently introduced into the

[3] Professor Morgan has arrived at the same conclusion with regard to the appearance of mutations in *Drosophila ampelophila.* Cf. AMER. NAT., 1914, "The Failure of Ether to Produce Mutations in *Drosophila.*"

greater part of this country. The color of the thorax (dorsal side), in most specimens, is light gray, each hair having a dark blackish brown spot at its base. These spots are somewhat irregular, and coalesce in certain regions.

In October, 1914, I collected a number of specimens of *D. repleta* in the zoological laboratory at Columbia University. About one sixth of these had a lighter color on the thorax than that found in normal flies. The dark spots, while of about the same number and color as usual, were much smaller and only coalesced in a few small regions. Several females of both kinds were isolated and their offspring observed. These females were, in each case, mated with males of their own kind: but they were of unknown age when captured, and several of them had probably already mated with other males. In the tables given here "dark" refers to the normal type; "light," to the new character.

TABLE I

WILD FEMALES

Culture	Mother	Offspring			
		Dark ♀	Dark ♂	Light ♀	Light ♂
J	Light	5	0	91	86
Q	Light	12	0	50	53
T	Dark	62	76	0	0
U	Dark	71	52	11	41
V	Dark	96	50	0	41
W	Dark	36	30	0	0
X	Dark	32	47	0	0

Light offspring from *J* and from *Q*, when mated together, gave 166 lights in the next generation—no darks. Darks from *T*, mated together, gave 180 darks—no lights.

On the basis of these results it is probable that the light character is a sex-linked recessive. The two light females, *J* and *Q*, had paired with dark males before being captured, since they produced a total of 17 dark offspring: but these darks were all females, showing either that the male-producing sperm of the father carried no dark factor (*i. e.*, that the factor is sex-linked), or that the light character is dominant in the males and recessive in the females.

Female *V*, since she produced light sons but no light daughters, must, on either of the above views, have been mated only by a dark male, and she must have been heterozygous for the light

character. Female *U* must have had the same constitution, but had probably mated with both kinds of males.

The crucial test between the two views was furnished by mating a dark female from culture *T* to a light male from *J*. The result was 25 dark females and 26 dark males. This is the expectation if the character is sex-linked; but if light is recessive in the females and dominant in the males, the mating should have given only dark females and *light* males. The light character is, therefore, sex-linked and recessive.

A further test was made by mating heterozygous females (one from *Q* and one from *U*) by their light brothers. Table II shows that the result approximates to the expected 1:1:1:1 ratio.

TABLE II

Culture	Dark ♀	Dark ♂	Light ♀	Light ♂
*Q*2	12	12	19	15
*U*1	15	17	17	13
	27	29	36	28

In all the cultures it has been observed that the heterozygous females average a little lighter in color than do the homozygous darks. This difference, however, is not sufficient to allow an accurate separation of the two classes. Dark males are of the same color as the homozygous dark females.

In October, 1914, I received some banana collected by Mr. B. Schwartz at Fayetteville, Ark. From it there hatched one *repleta* male, which was of the light type. Bred to light females from culture *J*, this male produced 133 offspring, all of which were light.

An examination of the pinned material in my own collection and that of the American Museum of Natural History has shown the existence of a number of specimens which seem to belong to the light type. The following table shows the distribution of the specimens examined. Those marked "not workable," are not in good enough condition to be classified with certainty.

The table shows the light form to occur in New York, Alabama, Arkansas, California, and Cuba. The Cuban record is of interest because the date, 1904, is the earliest of the seven cases.

TABLE III

Locality	Date	Dark	Light	Not Workable
Woods Hole, Mass.	June, 1913	3	0	
New York, N. Y.	Feb., 1913	2	1	
————	June, 1913	3	1	1
————	Oct., 1914	83%	17%	
Washington, D. C.	Oct., 1912	3	0	
N. Manchester, Ind.	Sept., 1913	2	0	
Daytona, Fla.	Mar., 1914	1	0	
Kushla, Ala.	June, 1914	3	1	
Fayetteville, Ark.	Oct., 1914	0	1	
Claremont, Calif.	May, 1914	4	0	
Newport, Calif.	Sept., 1913	2	6	1
Berkeley, Calif.	1914	2	0	
Near Havana, Cuba	Nov., 1904	3	3	3
Guantanamo, Cuba	Dec., 1913	5	0	1
Roseau, Dominica	June, 1911	5	0	1

At that time *D. repleta* seems to have been rather rare in the United States.

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